System Approach For Safety Oversight

Mission Need Statement
Number (335)

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Joint Resources Council

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1 ADMINISTRATIVE INFORMATION

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Date

2 IMPACT ON MISSION AREAS

The mission area most impacted by the needed capabilities described in this mission need statement is Safety. Under Title 49 US Code, and Title 14 of the Code of Federal Regulations, the Federal Aviation Administration (FAA) has a statutory authority to assure that air operators, air agencies, aircraft and airmen conform to the Federal Aviation Regulations and Aviation Safety Standards. The safety assurance is achieved by the FAA Flight Standards (AFS) service during certification, oversight and enforcement of aviation entities.

In 1997, the *White House Commission on Aviation Safety and Security Report* recommended that the FAA become more vigorous in the application of high standards for certification of new aviation businesses.[1] It also established the goal of reducing fatal air carrier accident rates by 80% by the year 2007. An additional performance agreement between FAA and DOT established the goal of reducing the general aviation accident rate by 20% by the year 2007.[2] This has resulted in a number of safety initiatives, referred to collectively as Safer Skies.

A comprehensive, integrated system safety approach to ensure that all air operators, including air carriers, pilots, engineers, maintenance facilities, training facilities, and ground crews operate at the *highest* level of safety represents AFS' number one priority.[3] The high priority of this mission need is in exact accordance with the FAA's primary goal to promote aviation safety.

In particular, the system safety approach is consistent with the Safer Skies initiatives and is targeted to support each of the FAA's safety strategies as delineated in the *FAA Strategic Plan* and the *FAA Achievement Plan* for fiscal years 2000-2002 and beyond:

- Accident Prevention: Based on detailed analysis of the recurrent causes of accidents, prevent accidents before they happen through appropriate, targeted, systematic interventions in the aviation system.
- Certification and Surveillance: Develop new approaches to working with others on certification, inspection, and surveillance and targeting FAA resources where they will do the most good.

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[1] Final Report to President Clinton, White House Commission on Aviation Safety and Security, February 12, 1997.

[2] 1998 FAA Strategic Plan

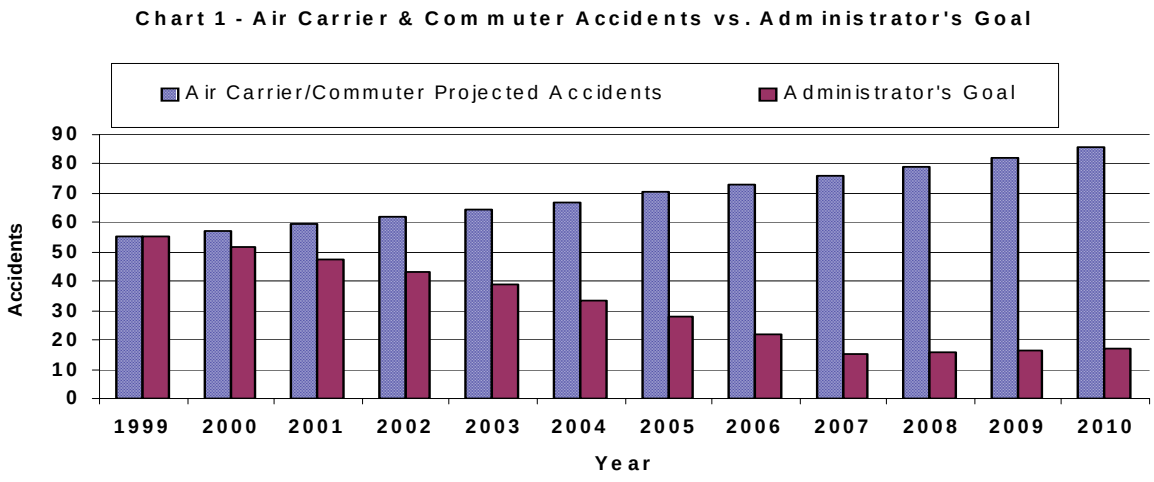
[3] In this document, system safety pertains to Flight Standards' Safety Mission to conduct certification and oversight activities, and enforce regulations with regard to air carriers, air taxi operators, commuter operators, general aviation and associated repair stations, flight schools, and mechanics. System safety is the application of special technical and managerial skills designed to identify, analyze, and mitigate hazards and risks within these components of the aviation system – including the people, cultures and attitudes, procedures, materials, tools, equipment, facilities and software employed by these entities.

- Safety Information Sharing and Analysis: Develop partnerships with the aviation community to share data and information supporting safe, secure aviation.
- Regulatory Reform: Implement a regulatory process that is timely, responsive, and consistently applied.

Each of these strategies is specifically designed to achieve the agency's highest priority safety mandate, an 80 percent reduction in aviation fatal accident rates by 2007.

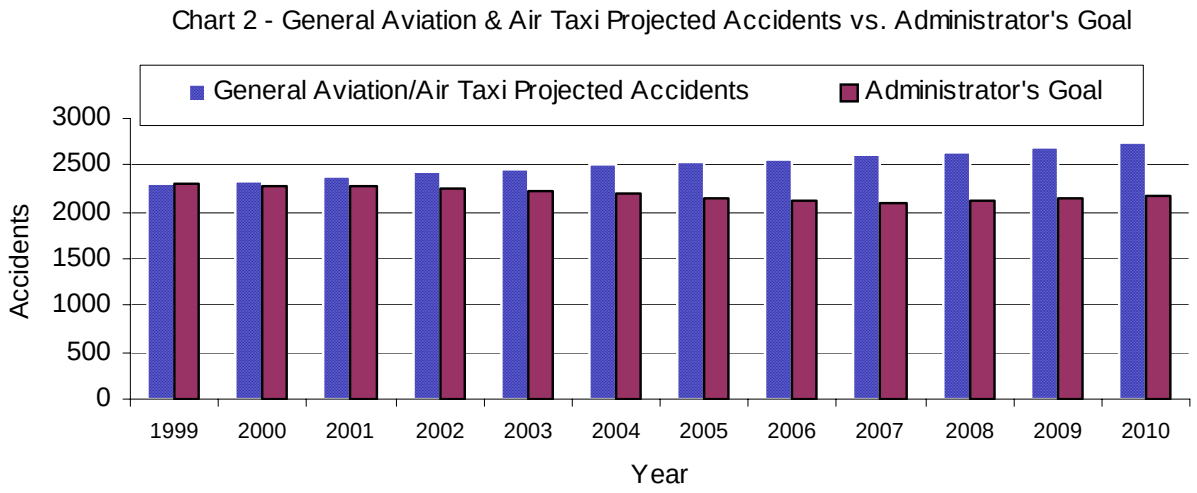
The system safety mission need identifies a critical FAA capability shortfall that must be filled if the agency is to meet its top priority, and succeed in achieving mandates promulgated by Congress, the White House, DOT, and the FAA. It will maximize AFS's contribution to safety.

The FAA Administrator and others are focusing on accident rates because estimated increases in traffic volume over the next ten years will result in unacceptable numbers of accidents if the accident rate is not reduced. Current forecasts predict a 48 percent increase in U.S. airline passenger travel over the 1999-2010 period.[4] If such an increase occurs, and accident rates remain at their current levels, the number of potential annual air carrier and commuter accidents could reach as high as 86 by 2010.[5] Charts 1 and 2, shown below, illustrate the gap between projected accidents and the Administrator's 80% and 20% accident reduction goals for air carriers/commuters and GA/air taxis, respectively.



[4] *Terminal Area Forecasts, Fiscal Years 1999-2015*, FAA-APO-99-7, December 1999.

[5] Projected accident levels were obtained by taking the median annual accident rate for the period 1986-1998 and applying it to the FAA's forecast of flight hours.



3 OPERATIONAL CONCEPT

The System Approach for Safety Oversight (SASO) operational concept will enhance the ability of Flight Standards to achieve its underlying mission of certification, surveillance, investigation, and enforcement. The systems-based concept for oversight is a multidisciplinary integrated comprehensive approach emphasizing cooperative problem solving, proactive identification, and mitigation of risk. The goal of SASO is to put in place an integrated suite of AFS business applications necessary to support such an approach. It will achieve this using a well-trained workforce equipped with reengineered business processes, comprehensive safety data, and sophisticated analytical tools and models working in an automated environment. A principal component of this approach is the integration of AFS' oversight and analysis processes.

System safety applies special technical and managerial skills to identify, analyze, assess, and control hazards and risks within all components of a system -- including people, cultures and attitudes, procedures, materials, tools, equipment, facilities and software. Its application in SASO proposes the development of a comprehensive set of new business processes for Flight Standards. These processes will be implemented using new analytical tools and models, new high-quality safety data assembled into integrated databases, new decision support tools, and comprehensive training. [6] More specifically, AFS has determined that a comprehensive system safety approach, or business model, must provide the following capabilities:

[6] In 1996 the 90-Day Review following the Everglades ValuJet 592 crash, the Miami Fine Air 101 accident, and a series of other mishaps, recommended a system safety operational concept. This recommendation stated that the FAA should "initiate a project to make surveillance of air carriers more systematic and targeted to deal with identified air carrier risks."

- Improve safety by making the promotion and communication of safety information an integral property of the entire system.
- Provide training in all elements of the system safety concept for implementation, support, and enhancement of AFS business processes.
- Provide core information and analytical infrastructure for AVR business processes, i.e. air carrier, airman, and air agency certification, surveillance, investigation, and enforcement.
- Identify, collect, store, and analyze safety data to support AVR safety goals using integrated standardized databases, infrastructure, or network.
- Provide the ability to identify and evaluate potential hazards in air carriers, airmen, and air agencies under AVR/AFS aviation systems business processes.
- Provide the most effective use of inspector resources by targeting inspections to the greatest areas of risk in the aviation environment.
- Provide users with integrated AFS business applications, including adequate decision support analysis tools and specific, well-defined processes to resolve identified hazards, i.e., closed loop functionality.
- Function in an integrated fashion with the existing AVR IT Infrastructure.
- Verify and measure the effectiveness of implemented hazard controls.
- Provide a framework for identifying systemic changes that provide intervention strategies for improvement within aviation systems, integrated with the rest of AVR's safety business processes and applications.

4 CURRENT/PLANNED CAPABILITIES AND SHORTFALLS

4.1 OVERSIGHT

The FAA provides the regulatory framework and inspector resources for the certification and surveillance of all air operators, air carriers, airmen, aircraft, and maintenance and training facilities. Currently, AFS conducts approximately 250,000 air operator, air agency, and airmen certifications, and approximately 300,000 air operator, air agency, and airmen surveillance activities.[7] These oversight activities require individual inspectors to conduct site visits, documentation reviews, observations, and testing.[8] Much of the certification activities require intense inspector preparation and involvement, often to the exclusion of other inspection duties. The demand for AFS' oversight services is increasing, as evidenced by the increasing numbers and types of aircraft, new operators, and certificate holders. Funding for the number of AFS inspectors has not kept pace and the deficit is expected to increase in the future.

[7] Aviation System Indicators, 1998 Annual Report.

[8] Documentation to be reviewed includes maintenance, operations and procedures manuals, operator programs, and training. Site visits include evaluations of training programs and operator procedures.

4.1.1 CURRENT/PLANNED CAPABILITY

Currently, AFS business applications are being developed under separately funded and managed initiatives, including the Air Transportation Oversight System (ATOS), the Certification Standardization and Evaluation Team (CSET), the Safety Performance Analysis System (SPAS) and the Aviation Safety Analysis System (ASAS) program.

Acting on mandates originating from Congress, the White House, and the FAA Administrator, AFS has taken preliminary steps to develop a comprehensive system safety approach to surveillance and certification.[9] AFS currently uses ATOS, a prototype system safety approach, to conduct oversight for the ten major air carriers.[10] Research for more sophisticated models is ongoing. As part of the planned, system safety model, AFS has established CSET to conduct certification on "new entrant" FAR Part 121 air carriers.[11] The team provides expertise to local district offices during certification. However, almost all certification work is still conducted at the Flight Standards District Office (FSDO) level, without the system safety methodology or the support of CSET. SPAS, begun in 1991, provides information access and decision support for ATOS and CSET and is undergoing further enhancements to improve its support for those programs.

Surveillance of all but the ten largest air carriers continues under the compliance-based National Work Program Guidelines (NPG). NPG is comprised of two components, required activities and planned activities. The required work activities represent a specific number of inspections that are conducted to assure the broad oversight of the aviation community.[12] The planned activities represent NPG-based guidance for additional oversight, depending on inspector availability and other competing work activities such as certificate management and accident investigation activities.

General Aviation (GA) surveillance activities also currently fall under the NPG. The number of work functions assigned depends on the nature of the activities at the local FSDO. General Aviation includes, but is not limited to air carriers certificated under 14 CFR Part 135 (small commuter air carriers), corporate operators, agricultural operators, air ambulances, balloons, air shows, pilot schools, maintenance technician schools, and small repair stations. A GA system safety program analogous to ATOS is in the planning stage. This program, the System Safety Approach for General Aviation (SAGA), plans to begin proof-of-concept work on Agricultural Aircraft Operations by 2002.

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[9] AFS FY2000 Business Plan. All discussed programs are presently funded under Safer Skies.

[10] The 10 major air carriers as determined by passenger enplanements are: Alaska Airlines, American, America West, Continental, Delta, Northwest, Southwest, Trans World, United, US Airways

[11] In September 1996 the FAA 90 Day Safety Review recommended that the FAA "create an FAA national certification team to assist local Flight Standards District Offices (FSDOs) in processing new air carrier certifications similar to the proposed Challenge 2000 Centers of Excellence."

[12] The required items are, however, insufficient in number to provide statistical confidence in any particular level of compliance in the aviation industry.

4.1.2 NEEDED CAPABILITY

The aviation industry today is characterized by emerging and rapidly changing technologies, increased operating complexity, rapid growth in commercial and general aviation air traffic volumes, and changes in the composition of the air transport fleet.[13] In conjunction with these changes, the National Airspace System (NAS) is undergoing sweeping changes of its own as it moves to implement the concepts and capabilities of the Free Flight paradigm.[14]

The accelerating pace of innovation in the aviation industry is placing unprecedented strain on Flight Standards' ability to achieve the Safety Mission as well as its ability to promote the safe growth of aviation within the National Airspace System. To reduce aviation accident rates in today's modern, technology-driven aviation environment, a compliance-only approach to oversight is no longer sufficient. AFS must institute a proactive, compliance-plus program for oversight that makes efficient use of increasingly limited resources to identify and mitigate risks.

Additionally, growth and enhancements to the NAS, like Free Flight, will introduce a host of new tracking and communications systems, with satellite, ground, and aircraft components. These in turn will introduce new operational procedures and training requirements at all levels. AFS will need to revise its surveillance and certification procedures to reflect these changes. A system safety approach will provide for improved coordination between AFS and other lines of business to maximize the benefits to the NAS.

AFS is currently attempting to resolve the reactive, compliance-only nature of its oversight activities with a shift to a proactive, compliance-plus system safety approach. The current compliance-only NPG approach is designed to find isolated incidences of non-compliance to regulations. It is a piecemeal approach, characterized by narrowly defined departmental solutions that tend to result in duplication of effort, conflicting information, and slow response. A system safety approach would go beyond compliance to identify system-wide safety hazards prior to their occurrence. It would entail developing business models, collecting and sharing quality data, and developing new analytical methodologies to assist Aviation Safety Inspectors (ASIs) in conducting their oversight job tasks.[15]

AFS has a needed capability to develop integrated comprehensive system safety business applications that will identify and manage risks, and to eliminate accident causal factors in the aviation industry. This requires that AFS develop and acquire new certification and surveillance data, linked data repositories with comparable data records and formats, new analysis and risk assessment tools to identify risks and target inspector resources, and training programs.[16] Within this framework, AFS must also integrate human factors

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[13] Recent trends in the air carrier industry include outsourcing of aircraft maintenance and pilot training, use of unproven safety practices by emerging carriers, and rapid innovation in aircraft types, engine types, and avionics equipment. These and other changes are increasing the demands placed on safety inspectors.

[14] NAS Architecture – Version 4.0

[15] Attachment 2 visually depicts the old way of performing oversight versus the system safety method.

[16] FAA Strategic Plan.

considerations, promote information sharing with the aviation community, and allow for continuous improvements that keep pace with and utilize advances in technology.

In order to support a system safety approach to aviation safety assurance AFS will need:

- The ability for ASIs to identify criteria for enforcement actions and interventions;
- New, high quality safety data with consistent format and content across AFS;
- Risk analysis capability for targeting resources effectively, and to the greatest safety hazards;
- Open architecture tools that provide the ability to capture and access safety data quickly and universally from government and aviation industry sources;
- Training for ASIs on the use of appropriate tool-sets so that oversight will be effective and consistent across AFS.
- A definitive body of regulations addressing system safety practices and guidelines.[17]

The White House Commission on Aviation Safety and the National Civil Aviation Review Commission have determined that a re-engineering of the FAA's regulatory and certification programs is necessary to achieve the accident reduction goal.[18,19] These two aviation safety-related commissions recommended that the FAA should conduct certification and oversight of all companies performing aviation safety functions, including repair stations located out of the United States. They further recommended that the FAA be more vigorous in applying high standards for certification, in establishing performance measures to focus resources and hold the agency's safety management accountable, in seeking changes to the traditional regulatory relationship so that tools beyond simple enforcement of rules are available to improve safety, and in using emerging concepts in technology, safety reporting, and risk management to help identify aviation safety problems before they result in accidents. Implementation of these concepts will require the collection, analysis, and sharing of all types of data and information.

4.1.3 SHORTFALLS

Surveillance for only the ten major air carriers and certification for only Part 121 new entrants is currently handled under the system safety umbrella.[20] Moreover, the current system safety business model that is being applied to the ten major carriers is only a prototype – and is currently being re-engineered to increase envisioned functionality. The system safety approach

[17] If a rulemaking is needed, it will be conducted under the direction of AVR's Office of Rulemaking (ARM).

[18] White House Commission on Aviation Safety and Security

[19] National Civil Aviation Review Commission, Avoiding Gridlock and Reducing the Accident Rate, December 1997

[20] "Part 121" refers to an air carrier certificate holder operating under Title 14 of the Code of Federal Regulations Part 121.

is not applied to the majority of aviation entities, including the remaining smaller Part 121 air carriers, Part 135 commuter operators and general aviation, as well as repair stations and pilot schools, among others. These aviation entities require a similar depth of oversight as large air carriers.

More specifically, AFS must

- Finalize the system safety business model for the ten major air carriers (current functions and capabilities in the system safety business model must be revised and matured)
- Expand the system safety business model to incorporate the remaining Part 121 carriers
- Develop system safety business models for Part 135 carriers, General Aviation and other aviation entities

AFS currently lacks data collection tools and methods necessary to support a system safety approach to aviation safety assurance. Inspectors currently have an extremely limited analysis support capability to enter, review, or analyze data generated through the new system-safety oversight process. Quality data, metrics, and performance measures based on the safety attributes of the aviation community do not exist, thereby limiting the ability to perform statistical and trend analysis, including system and root cause analysis. Data integration functionality between data collected for certification activities and data collected for surveillance activities does not exist. For example, data collected upon initial through CSET certification is not readily available to inspectors when conducting oversight activities through ATOS.

There are currently approximately 40 non-relational databases (NBIZ, NPTRS, OPSS etc.…) with varying formats, data elements, and definitions within AFS. Current databases are not well integrated and data are not shared seamlessly across operations. Risk analysis capability to target resources to the greatest safety hazards is limited because of gaps in current data collection and non-compatibility in infrastructure between systems and data. Statistical analysis algorithms, dependent on quality data, must be developed. Quality control mechanisms, including database software to ensure the timely and efficient collection and dissemination of the data are not defined nor implemented.

Training requirements associated with the use of system safety methods and automation tools are not developed. Integrated procedures to meet the demands presented by an increasingly complex aviation community, such as air carrier outsourcing of maintenance and other functions that have a direct impact on safety do not exist.

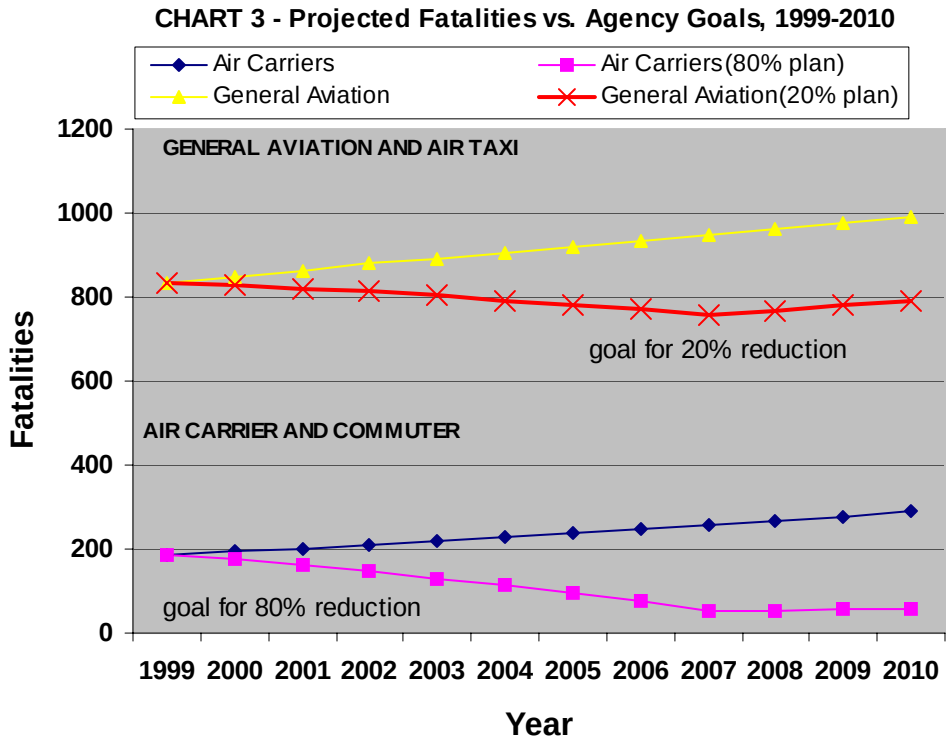
Attachment 1, found at the end of this document, presents current/planned and needed capabilities, and capability shortfalls in tabular form.

5 IMPACT OF NOT APPROVING THE MISSION NEED

Failure to implement a comprehensive systems safety approach and the needed AFS business applications will render the FAA incapable of meeting safety-related mandates, including those stipulated by the White House, Congress, and the FAA Administrator that call for a five-fold reduction in accidents by the year 2007. The targeted reductions cannot be achieved with the present capability in AFS. Given the current accident rate for US carriers, combined with the forecasted increase in air traffic, if no action is taken, the agency risks unacceptable increases in human injuries and fatalities. A recent Boeing study has captured the magnitude of this issue: "by 2015 airlines in the U.S. will carry 1.2 billion passengers, roughly the same amount carried by all the world's airlines today. If the accident rate remains at today's levels, we could have a large jet aircraft crash every seven to ten days..."[21] *Chart 3* below illustrates the reductions targeted by the Administrator relative to a continuation at current accident rates. This would detrimentally affect the Administrator's goals for the Safety mission area.

If the shortfalls listed above are not alleviated, AFS will not be able to achieve a full system safety approach to certification and surveillance. Specifically, if the current AFS business model for system safety is not expanded beyond the ten major air carriers, it will be extremely difficult to collect key data that will serve to identify accident causal factors and mitigate risks or safety hazards. Moreover, the simple expansion of the model to include other-than-ten major carriers and other aviation entities will not solve the data collection issue. Unless the data is meaningful, understandable, and universally applicable, statistical analysis remains difficult at best, thus limiting the ability of the ASIs and others to identify problems within the aviation system. Once problems are identified, comprehensive decision tracking and support tools must exist in order to ensure that ASIs take appropriate and timely action to mitigate risks.

[21] National Civil Aviation Review Commission, Avoiding *Aviation Gridlock and Reducing the Accident Rate – A Consensus for Change,* December 1997

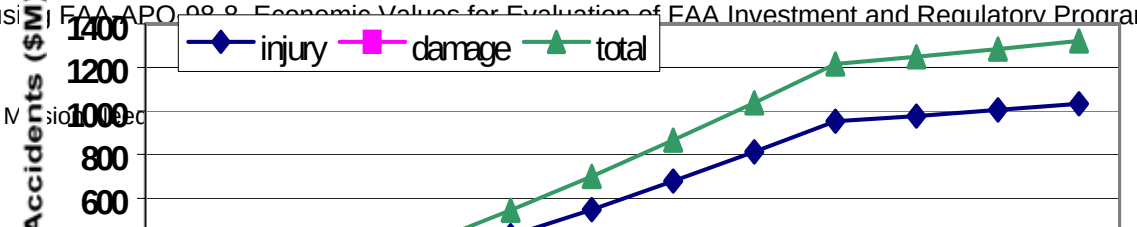


6 BENEFITS

The most significant source of benefits from the program is in the area of safety - specifically, a reduction in the rate of accidents in the air carrier, commuter, general aviation, and air taxi operations. The potential benefits of achieving the Administrator's goal of 80% fewer air carrier accidents and 20% fewer general aviation accidents are tremendous. The difference (benefit) made by achieving the Administrator's goal relative to a scenario holding accident, injury, and damage rates at current levels is shown in *Chart 4* below.[22] Total annual benefits pass the billion-dollar mark in 2006, and reach 1.3 billion a year by 2010. One way of illustrating the size of these potential benefits is to note that the break-even point for the cost projections provided in Section 7, below, is reached if SASO achieves as little as 2.3% of the Administrator's goal. It is equivalent to preventing one major air carrier accident.

Chart 4 - Benefits of Achieving the 80/20 Plan

[22] Potential benefits were calculated by assuming that damage and injury rates will decline in proportion to the accident rate, then evaluating the reduction in accidents projected by achieving the Administrator's goal using FAA-APO-98-8, Economic Values for Evaluation of FAA Investment and Regulatory Programs.



The experience of the military in applying system safety to airplane design and operation shows these benefits are realistic. The USN Naval Safety Center has compared the performance of system safety designed aircraft against operationally equivalent aircraft designed without the system safety approach.[23] Specifically, they compared the F/A-18 to the A-7 and the F-14 to the F-4. Over a period of 500,000 flight hours, the accident rates for the aircraft using the system safety approach (F/A-18 and F-14) were 80 percent and 60 percent lower, respectively. This resulted in savings of nearly 5 billion dollars for aircraft replacement costs alone over the ten-year period examined.

Because accidents, especially severe accidents, are rare events, they are difficult to use to provide a statistically reliable short-term indicator of trends and causality in safety performance. Yet, there are indicators that suggest the system safety approach is capable of generating these benefits. Current oversight practice focuses on each potential hazard in isolation, and accident investigation on identifying the primary cause, while accidents are usually the result of multiple failures with the primary cause being insufficient to cause the accident without the influence of the secondary causes. System safety expands oversight analysis by providing tools to identify patterns of sub-critical individual failures that combine to create an accident. System safety also works to create the opportunity and environment for continuous reporting of potential safety hazards by all employees, thus helping to target the need for inspections. The experience of Australia's INDICATE program suggests this can provide a safer environment, reducing the potential for accidents.[24]

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[23] Data were provided by Scott VanBuren from the December, 1988 USN Naval Safety Center's study "The Effectiveness of System Safety for Reducing Naval Mishaps" by W. Mannschreck.

[24] INDICATE stands for identifying Needed Defenses in the Civil Aviation Transport Environment. It is a system for proactively monitoring airline safety performance that was implemented as a pilot program by Australia's Bureau of Air Safety Investigations (BASI) in 1996. The results of this pilot program are evaluated in the paper "An Evaluation of the BASI-INDICATE Safety Program." This paper and other information on the program can be obtained from the BASI website – www.basi.gov.au.

A secondary source of benefits is the improvements to the efficient allocation of resources. The key to maximizing efficiency rests with the most cost-effective, proactive, integrated, comprehensive approach to solving the data and information management issues as well as the structured evolution of analytical tools and models to translate the information into knowledge from which to act upon. The integration of the oversight activities within AFS under the guidance of the "system safety" philosophy will also result in two significant business improvements:

- Non-material - from the workforce and mission perspectives, integrating inspection and certification activities, formerly conducted under at least three separate programs, will reduce duplication of effort and optimize the support infrastructure.
- Material - the consolidation and standardization of the data collected in these activities will provide a basis for a more efficient use of computing and storage resources. High-quality data will allow development of sophisticated analytical tools to identify risk in the aviation system thus increasing inspector knowledge and effectiveness by allowing for targeted inspections and actions in areas of highest potential vulnerability and probability of hazard.

The combination of business process re-engineering and the integration of better job performance aids will ensure a more efficient workforce. The additional benefit of information sharing with the air transportation industry will improve the oversight process, thereby increasing the FAA's effectiveness in mitigating or preventing aircraft accidents. A systems approach to safety may also improve public perception of the Agency's role in safety assurance and reduce the FAA's liability for failure to act, or ineffectively act, due to poor methodologies or knowledge in the conduct of its oversight role.

7 LONG RANGE RESOURCE PLANNING

At this time it is extremely challenging to develop an accurate funding projection for this program. In the absence of either a unique solution or an approved solution, the best that can be provided is an order-of-magnitude estimate as to the likely cost levels. Historical cost data for existing programs that perform functions analogous to those needed for this mission were consulted. Expert opinions were solicited in a number of areas as to what would constitute a reasonable level or range of costs. The information from these and other sources was then combined into the table below.

ORDER of MAGNITUDE COST ESTIMATE
(millions of escalated $)

	2003	2004	2005	2006	2007	2008	2009	Total
Research, Engineering, and								

Development								
Methods/Model Development	5.1	2.4	2.4	0	0	0	0	**9.9**
Total RE&D	**5.1**	**2.4**	**2.4**	**0**	**0**	**0**	**0**	**9.9**
Facilities and Equipment								
Requirements Analysis & System Design	10.3	8.9	6.8	3.9	1.6	0.6	0.4	**32.5**
System Development, Testing & Implementation	8.2	11.2	12.5	11.8	10.3	5.3	1.8	**61.0**
Initial Training	2.1	2.2	3.4	3.9	4.0	5.9	4.9	**26.4**
Total F&E	**20.6**	**22.3**	**22.7**	**19.7**	**15.9**	**11.7**	**7.0**	**119.9**
Operations and Maintenance								
Business Applications Operations	5.8	4.9	4.2	4.2	4.3	4.4	4.5	**32.5**
Program Management	1.4	1.2	1.0	1.1	1.1	1.1	1.1	**8.1**
Validation / Evaluation	1.4	1.2	1.0	1.1	1.1	1.1	1.1	**8.1**
Business Applications Maintenance/Enhancement	3.6	3.1	2.6	2.7	2.7	2.8	2.8	**20.2**
Recurrent Training	2.2	1.8	1.6	1.6	1.6	1.7	1.7	**12.1**
Total O&M	**14.4**	**12.3**	**10.4**	**10.6**	**10.8**	**11.0**	**11.3**	**80.8**
GRAND TOTAL	**40.1**	**37.0**	**35.5**	**30.3**	**26.7**	**22.7**	**18.3**	**210.6**

Numbers may not add exactly due to rounding

ATTACHMENT 1 – CAPABILITIES AND SHORTFALLS

System Safety Element	Current/Planned Capability	Needed Capability	Shortfalls
Business Practices	Compliance-based certification and surveillance method for all but 10 major air carriers. • Inspectors perform a predetermined number of required inspections per year. • Inspection activities are subject to inspector's discretion. • Duration of each inspection can range from ten minutes to several hours. • Duplication of effort is possible. For the top 10 air carriers, modules of a preliminary system safety model have been developed and implemented. • "Bottom-up, systematic team approach to inspection • Inspectors examine each of the air carrier's processes (i.e. training, deicing, dispatch, etc.) to ensure that safety attributes (responsibility, authority, procedures, etc.) are built in. • Initial inspections take approximately one month with a team of 4-5 people.	A comprehensive set of system safety oversight business process models to identify and manage risk and eliminate accident causal factors for all operators. A definitive body of regulations addressing system safety practices and guidelines.	• System safety business model processes and procedures for 10 major air carriers are not yet complete. Improvements and development of the eight modules (system configuration, certificate management, surveillance resource management, surveillance implementation, reporting, evaluation, analysis, and implementation) must occur. • System safety business model processes and procedures for remaining air carriers, commuter air carriers, general aviation and other aviation entities. • Automation to support the implementation of an overall system safety business model. • Supporting regulatory guidance for system safety practice as it applies to aviation

ATTACHMENT 1 (Continued) – CAPABILITIES AND SHORTFALLS

System Safety Element	Current/Planned Capability	Needed Capability	Shortfalls
Data	Data and data systems are inconsistent in format, structure, and content across AFS systems. • Example: Data/information obtained through oversight for air carriers are maintained in one database. Repair stations, commonly used by these air carriers, are inspected by GA ASIs. This information is maintained in a separate database.	Data collection tools and methods to support system safety. Timely, onsite accessibility to data pertaining to all aviation entities is required.	• Clearly defined data, formats, and business rules. • Data collection methods and tools, including work process models. • Consistent data quality measures and standards. • A database structure that promotes the integration of data systems across AFS organizations and tools. • Definition of supporting communications infrastructure, including servers, high-speed data lines, and facilities.
Resources	Despite recent increases in staff, workforce resources remain limited when compared to growth projections in air carriers, air traffic, and complexity of aviation entities.	In order to keep pace with a growing industry, business practices that optimize inspector resources must be developed.	• Business processes that permit the inspector workforce to keep pace with the evolving aviation industry. • Workforce skills in alignment with the collection and analysis needs of the new business processes.

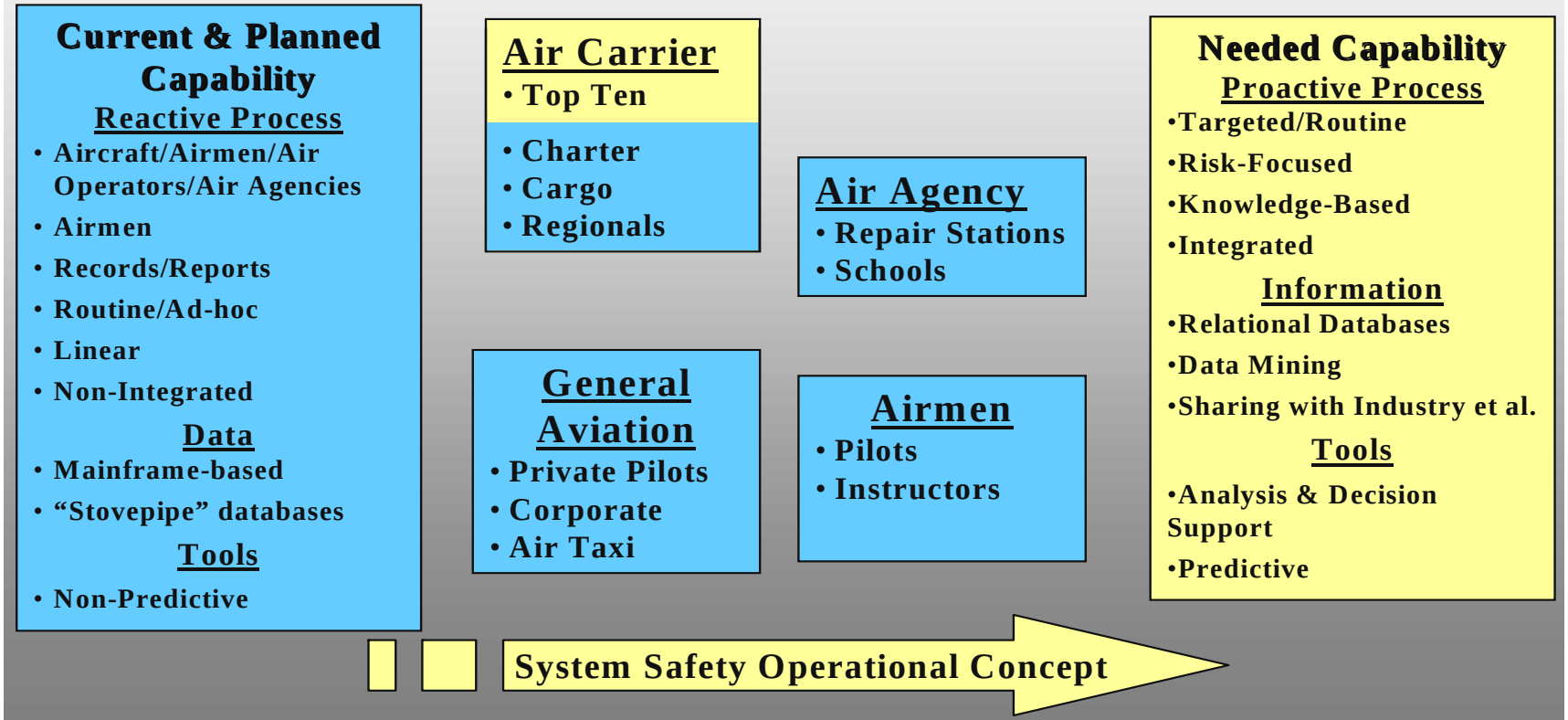
ATTACHMENT 1 (Continued) – CAPABILITIES AND SHORTFALLS

System Safety Element	Current/Planned Capability	Needed Capability	Shortfalls
Training Programs and Materials	A small percentage of ASIs have been trained in new business practices (system safety). Workforce has limited capability to do data collection and analysis. Guidance and training materials available to ASIs are poorly disseminated, difficult to find or access, and may contain contradictory information.	Adequate training and recurrent training for all inspectors for both oversight and analysis. Streamlined (concise, consistent) guidance materials for inspectors and aviation entities. Accessibility to automated guidance materials.	• Training programs to support a system safety approach. • Materials to support a system safety approach.
Integration of Business Functions	There is limited integration between current certification, surveillance, investigation, and enforcement activities.	Fully integrated certification, surveillance, investigation, and enforcement capability. Integrated decision support capability	• Policies and procedures to integrate oversight and enforcement responsibilities and activities. • Integrate oversight data collection protocols, databases, decision support tools, and lines of communication. • Integrated project management and tracking capability across business functions.

ATTACHMENT 1 (Continued) – CAPABILITIES AND SHORTFALLS

System Safety Element	Current/Planned Capability	Needed Capability	Shortfalls
Coordination with Agency and Industry	Currently, there is limited coordination between the FAA and industry. The Agency has begun to initiate partnerships with air carriers concerning a system safety model.	Partnership within the FAA lines of business and among the FAA, industry, and remaining aviation entities.	• Coordination with other FAA lines of business and industry to develop supporting policies. • Inter-connectivity capabilities with external data sources.
Risk Management and Analysis	The primary data source is job task-based. Workforce has limited analysis capability to support system safety oversight process.	A comprehensive set of risk analysis support capabilities, including system models, analytic methods, work prioritization, and analytical software tools.	• Risk analysis concept, analytical methodologies, and decision support requirements must be refined. • Quantitative and qualitative metrics to support system safety, including performance measures and risk indicators. • Risk, hazard and accident models. • Predictive/forecasting tools for system safety. • Data collection and sharing protocols with industry to support hazard analysis.

Evolution to Needed Capability



ATTACHMENT 2